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## Women's mobility and labor supply: Experimental evidence from Pakistan

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# WOMEN'S MOBILITY AND LABOR SUPPLY

EXPERIMENTAL EVIDENCE FROM PAKISTAN

*Erica Field and Kate Vyborny*

**NO. 655**

.....  
April 2022

**ADB ECONOMICS  
WORKING PAPER SERIES**

ADB Economics Working Paper Series

## Women's Mobility and Labor Supply: Experimental Evidence from Pakistan

Erica Field and Kate Vyborny

No. 655 | April 2022

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## **ABSTRACT**

In cities with conservative norms or high crime, female workers may face greater restrictions on their physical mobility. This limits women's labor market opportunities and the pool of workers that firms can attract. In this study, we experimentally vary access to a transport service in Lahore, Pakistan, to quantify the overall impact of transport to work on men, women, and the differential impact of transport exclusively for women. We show that reducing physical mobility constraints has a large impact on job searching for women, including women who are not searching at baseline. Women's response is driven by a women-only transport treatment arm, suggesting that safety and social acceptability, rather than simply cost, are key constraints.

*Keywords:* transport, mobility, gender, female labor force participation

*JEL codes:* J16, J22, J28, L91



## I. INTRODUCTION

Urban labor markets in low-income countries are home to a rising number of unemployed, underemployed, and economically inactive people (International Labour Organization 2017). In South Asian cities, women are less likely than men to participate in the labor market, even at relatively high levels of education (Field and Vyborny 2016; Fletcher, Pande, and Moore 2018). Although some of these women are deeply detached and unlikely to participate in response to policy changes, survey data suggest that a large number of women may be “latent jobseekers” who are at the margin of participation if specific barriers can be addressed (Donovan, Lu, and Schoellman 2020): While one quarter of women in Pakistan’s Demographic and Health Surveys work outside the home, another quarter say they are willing to work—suggesting that female labor force participation could double if these women found employment (Field and Vyborny 2016).

One of the reasons women may not search for employment is that they have limited physical mobility, due to pervasive stigma, harassment, or violence on public transport or in the public space (ADB 2015, FIA Foundation 2016, Sajjad et al. 2018, Qutub and Anjum 2015). This may limit women’s ability to commute safely. In this study, we investigate the constraints on women’s labor force participation due to limited safe mobility for the daily commute to and from work. We study a representative sample of male and female residents of Lahore, Pakistan, including the employed, unemployed, and economically inactive. We emphasize the importance of studying the latter group, economically inactive “latent jobseekers,” who represent the population with the largest potential benefit from reductions in labor market barriers. This group is particularly important for understanding gender differences, because in settings such as Pakistan a high fraction of the female population are latent workers. Hence, policies that successfully encourage participation may have a particularly large impact on labor markets and female economic empowerment. However, this population is particularly difficult to identify, reach with interventions, and observe, precisely because they are inactive in the labor market, and female “latent” jobseekers often lack independent access to sources of information such as telephones and internet (half the women in our sample share a phone with another household member, typically a male).

To fill this gap, we developed a new job matching platform, Job Talash, and enrolled a population including both active and “latent” female and male jobseekers as well as a large sample of firms. This incorporated representative listings of thousands of households and thousands of firms; development, piloting, and refinement of a high-frequency job matching service that lists jobs and delivers information to respondents about them through short messaging service (SMS); and a call center. Job Talash allows us to both observe job search behavior and deliver interventions. This platform generates high-frequency, detailed data on both the supply and demand sides of the labor market for hundreds of thousands of potential job matches between firm and respondent. Because we provide information to both sides, we observe exactly the same information as both sides of the market up to the point of an interview.

In the first phase of scale-up of our transport randomized controlled trial (RCT), we show that (1) reducing physical mobility constraints has a large impact on job search for women and not for men; (2) women’s response is driven by a women-only transport treatment arm, suggesting that safety and social acceptability, rather than simply cost, are key constraints for women’s mobility; and (3) women who are inactive at baseline—neither working nor searching—respond to a women-only safe transport

treatment by increasing their job search, but do not respond to mixed-gender transport, suggesting that this constraint may play a role in women's employment decisions on the extensive margin.

Our study contributes to three literatures.

First, there is a growing literature exploring the underlying factors limiting female labor force participation, in particular social norms (Fernández 2013; Field et al. 2021; Bertrand, Kamenica, and Pan 2015; Bernhardt et al. 2018; Bursztyn, González, and Yanagizawa-Drott 2020; see Jayachandran 2021 for a full review) and safety (Velásquez 2019, Siddique 2018, Chowdhury 2019). These studies do not specifically investigate physical mobility as a channel for these effects.

A second strand of literature specifically investigates gender differences in physical mobility and quantifies their costs for women who move in the public space (Kondylis et al. 2020; Aguilar, Gutiérrez, and Villagrán 2021; Christensen and Osman 2021; Borker, Kreindler, and Patel 2020). These studies focus on responses to constraints in physical mobility, but do not measure labor supply.

A third literature, which is closest to our work, documents spatial frictions as a mechanism for gender disparities in access to education (Muralidharan and Prakash 2017, Cheema et al. 2020, Burde and Linden 2013, Jacoby and Mansuri 2015, Borker 2021).

To our knowledge, our study is the first to experimentally quantify the impact of constraints on women's physical mobility on labor supply and demonstrates a large and gendered impact of these frictions.

In addition, our sample is unusual in that it includes people who were not participating in the labor market at baseline. We show that non-participants can be induced to search for jobs. This shows that non-participants may have high latent returns to search, which is particularly relevant given gender gaps in labor force participation. It also suggests that experimental studies of urban labor market frictions studying only active jobseekers may understate the importance of these frictions.

The remainder of the paper proceeds as follows. Section II describes the job matching platform on which our experiment takes place and highlights descriptive findings from the data generated by the platform. Section III describes the experimental design, and Section IV the estimation approach. Section V discusses the results, and Section VI concludes.

## **II. SETTING AND DESCRIPTIVES**

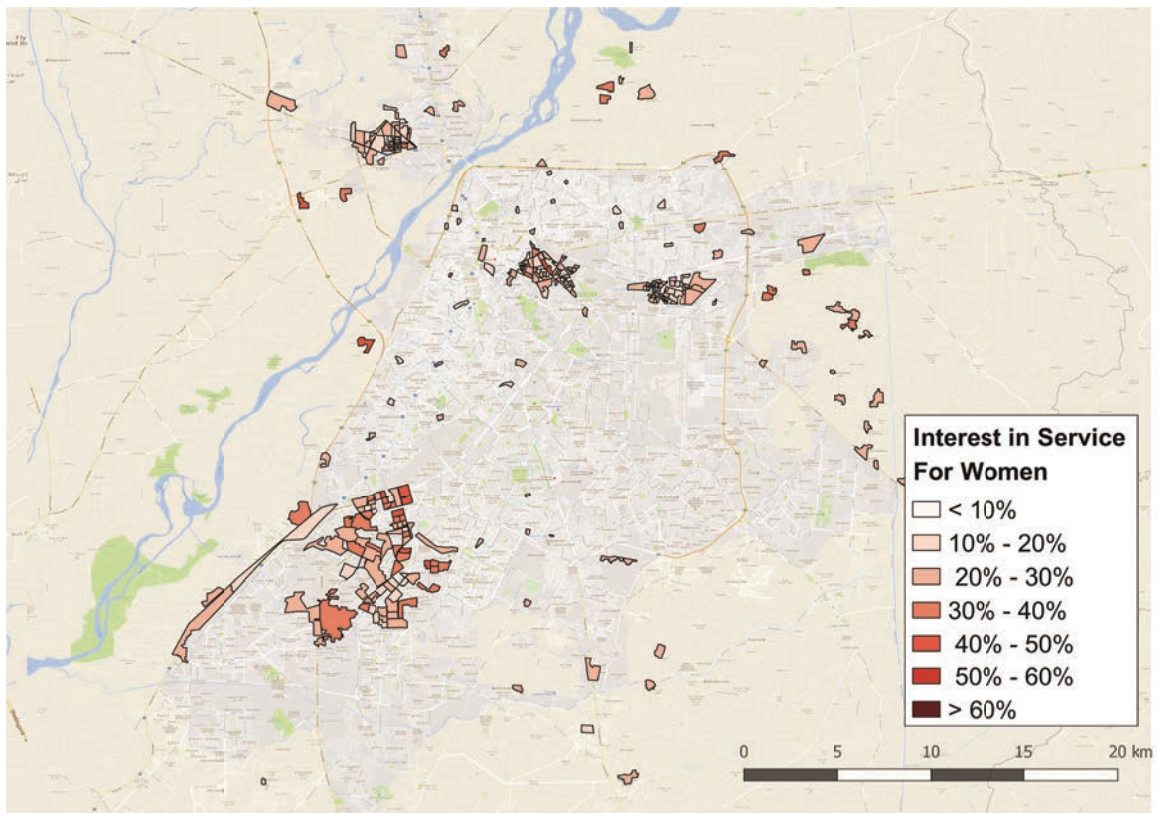
Our experiment took place on the employment assistance service, Job Talash, set up by the research team in Lahore, Pakistan from 24 September 2018 to 22 October 2019. Lahore is the second largest city in the country and is socially seen as more liberal than many parts of the country. Despite this, only 10% of women aged 25–60 in the district were working as of the 2019 Pakistan Social and Living Standards Measurement (PSLM) survey. This reflects a larger pattern of lower female labor force participation in many urban contexts in South Asia (Fletcher, Pande, and Moore 2018; Field and Vyborny 2016). Subsections A to C detail each component of the development of this job service platform.

## A. Enrolling Respondents

Many studies of interventions to support job search and employment begin with a population of active seekers, for example recruiting through job search services. This implies that these samples are not able to capture the extensive margin: individuals who may not be searching at all because of the very constraints that we study in the experiment. Thus, we recruited all active seekers and inactive individuals open to the possibility of working from a sample of households representative of Lahore District. This allowed us to identify such individuals and ensured that their baseline search status did not affect their inclusion in the sample.

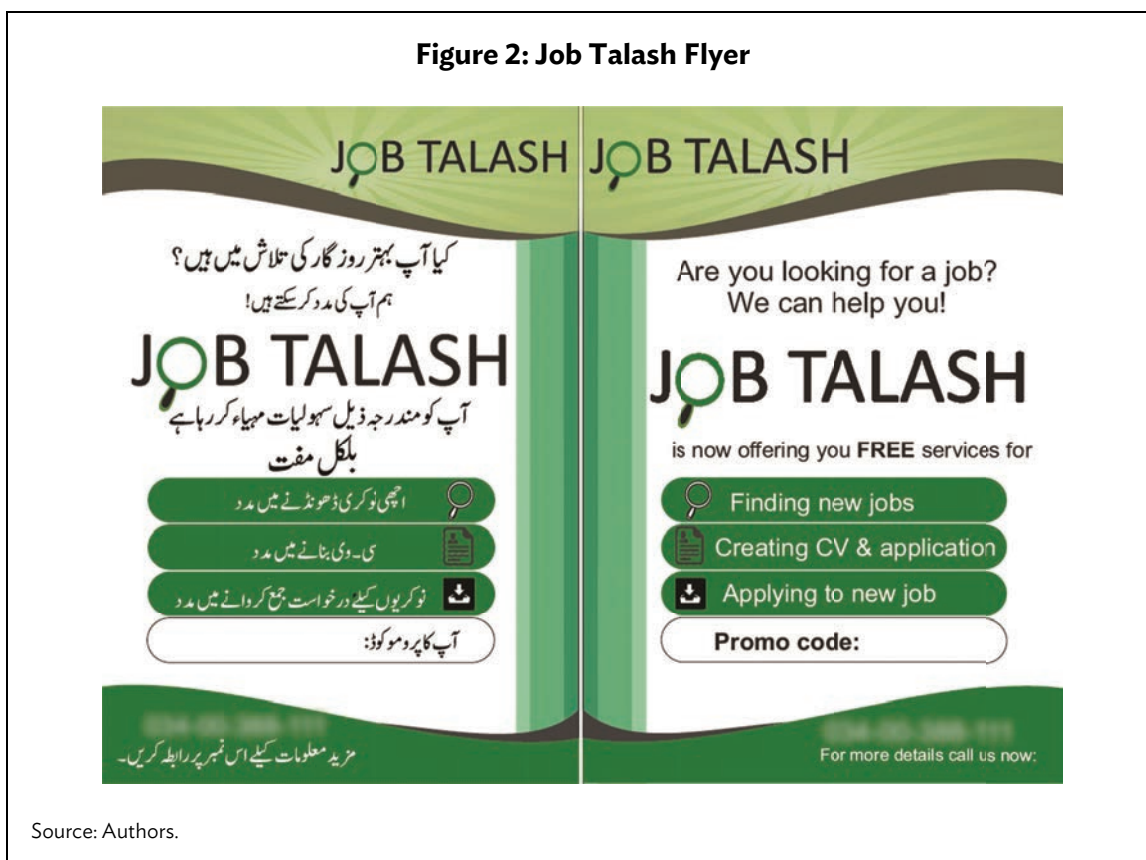
We worked with the Punjab Bureau of Statistics to digitize existing paper enumeration block maps covering Lahore District and mapped them to commuting zones developed as part of the 2010 Lahore transport masterplan. We used this sample frame to draw a clustered random sample of enumeration blocks. In each block, we listed all households found. This led to a listing of approximately 50,000 households across metropolitan Lahore (Figure 1). We recorded a roster with age, education, and current work status for all adult members, for a total sample of approximately 150,000 adults. For each member (whether currently working or not), the enumerator asked if s/he was interested in signing up for Job Talash. All households were provided with flyers with unique codes (Figure 2).

**Figure 1: Household Listing Enumeration Blocks and Women's Initial Interest in Signup for Job Talash**



Source: Authors' calculations using data from Centre for Economic Research in Pakistan Women's Mobility Project household survey.

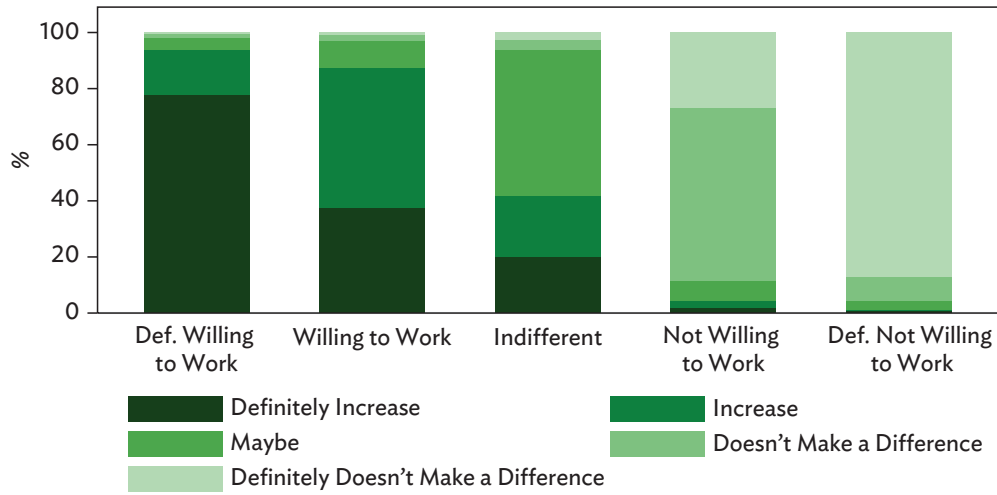
Figure 2: Job Talash Flyer



Source: Authors.

Descriptive statistics from this listing exercise confirmed that women who were initially not available to work did not anticipate changing this decision on the basis of transport availability (Figure 3); hence, we anticipated little to no treatment effect of a transport offer on their decision not to search. Therefore, we focused on the sample of individuals who were initially interested in the possibility of work. The Job Talash call center called individuals who indicated interest and gathered detailed information on the applicant's education, work experience, job search activity, and preferences for different kinds of jobs. This yielded a total sample of approximately 10,000 subscribers. The signup process enrolled men and women of all education levels (Figure 4). Fifty percent of male and 60% of female participants who signed up were not actively searching for jobs at baseline: this approach indeed successfully identified "latent" jobseekers who would have been missing in a sample of active searchers (Figure 5). The enrollment of the Job Talash sample from the full listing allowed us to compare our estimates to the full population.

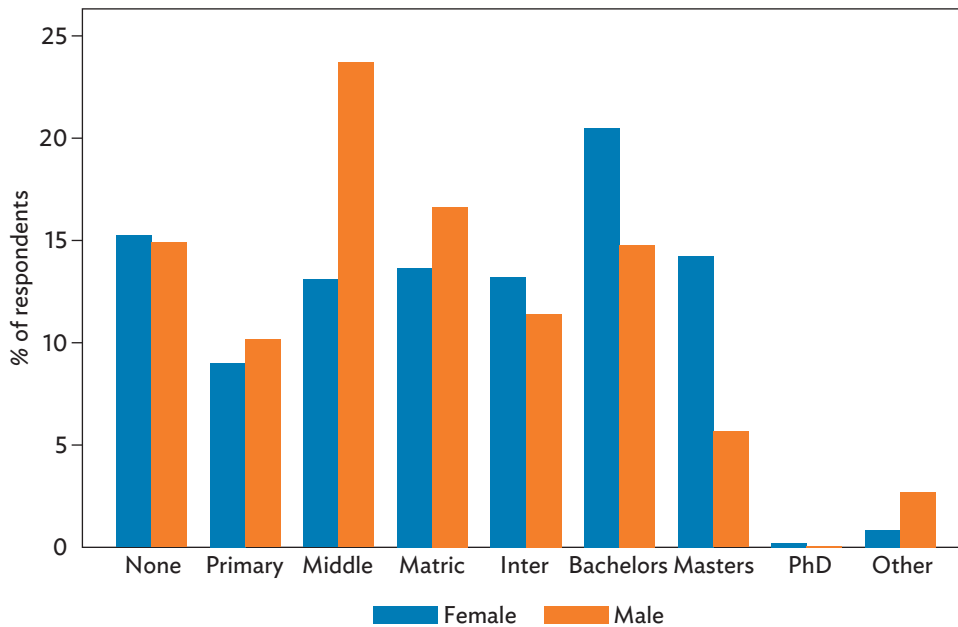
**Figure 3: Stated Anticipated Effect of a Transport Offer on Probability of Taking a Job Among Female Latent Jobseekers in Household Survey**



Note: The sample sizes are: definitely willing to work = 5,503; willing to work = 5,688; indifferent = 6,439 not willing to work = 14,650; and definitely not willing to work = 55,933.

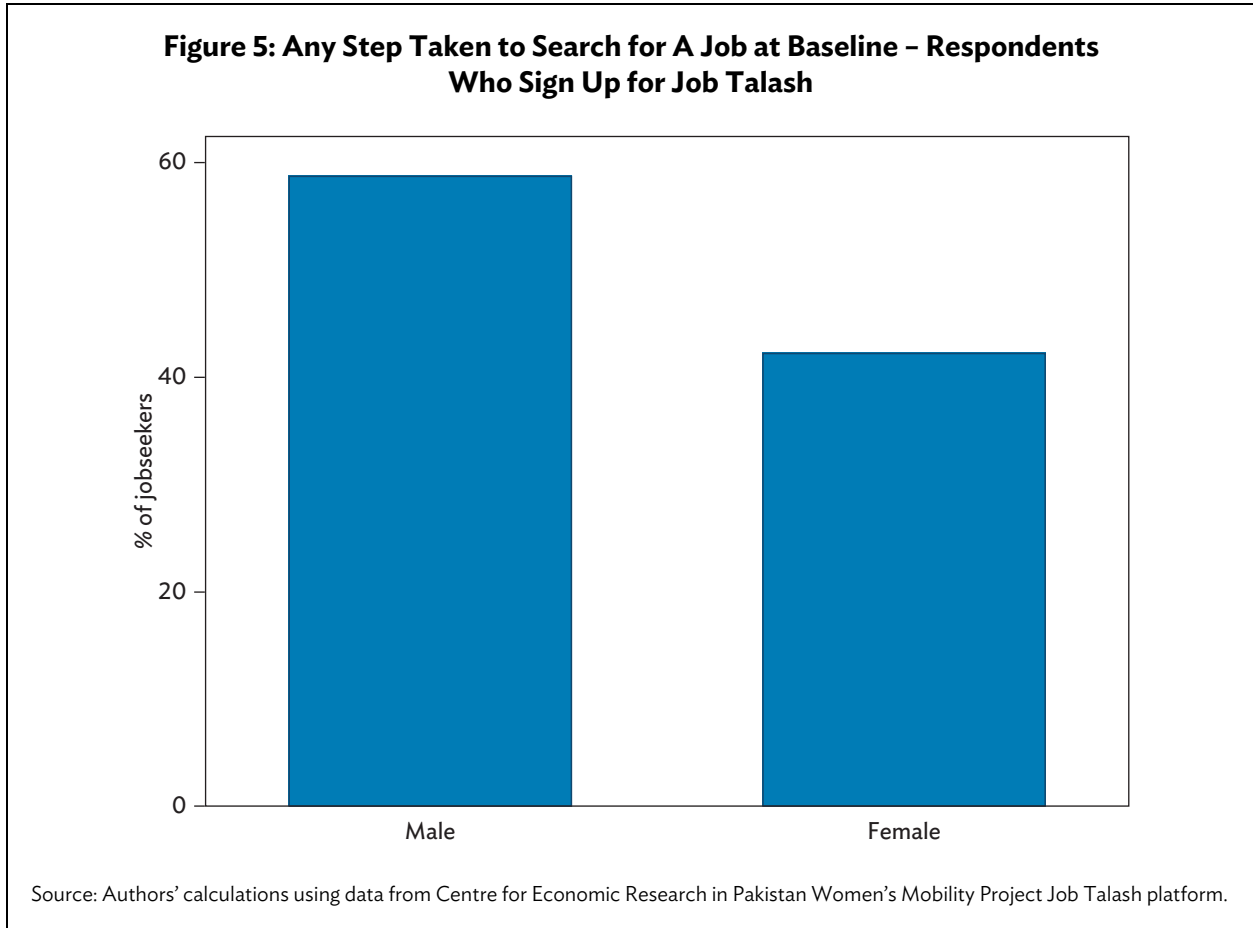
Source: Authors' calculations using data from Centre for Economic Research in Pakistan Women's Mobility Project household survey, 2016–2017.

**Figure 4: Education Composition of Job Talash Subscribers**



Note: The sample sizes are: male = 7,218; female = 3,340; and for education composition: none = 1,584; primary = 1,034; middle = 2,147; matric = 1,657; inter = 1,264; bachelors = 1,751; masters = 885; PhD = 12; others = 223.

Source: Authors' calculations using data from Centre for Economic Research in Pakistan Women's Mobility Project Job Talash platform.



The average age of both female and male subscribers was about 30 years. About half the female study participants had a high school degree, compared to 35% of men. About three-quarters of women and more than 90% of men had some work experience (Tables 1 and 2).

**Table 1: Descriptive Statistics and Balance: Female Subscribers**

| Variable                           | (1)<br>Women's<br>Transport |                   | (2)<br>Mixed<br>Transport |                   | (3)<br>Control |                   | t-test<br>Difference<br>(1)-(2) | t-test<br>Difference<br>(1)-(3) | t-test<br>Difference<br>(2)-(3) |
|------------------------------------|-----------------------------|-------------------|---------------------------|-------------------|----------------|-------------------|---------------------------------|---------------------------------|---------------------------------|
|                                    | N/[Clusters]                | Mean/[SE]         | N/[Clusters]              | Mean/[SE]         | N/[Clusters]   | Mean/[SE]         |                                 |                                 |                                 |
| Proportion applied<br>baseline     | 512<br>[55]                 | 0.030<br>[0.010]  | 1,123<br>[112]            | 0.030<br>[0.006]  | 1,014<br>[116] | 0.017<br>[0.005]  | 0.000                           | 0.013                           | 0.013                           |
| Working at<br>baseline             | 512<br>[55]                 | 0.133<br>[0.017]  | 1,122<br>[111]            | 0.145<br>[0.012]  | 1,014<br>[116] | 0.124<br>[0.011]  | -0.012                          | 0.009                           | 0.021                           |
| High women's<br>mobility household | 510<br>[55]                 | 0.414<br>[0.024]  | 1,120<br>[111]            | 0.407<br>[0.017]  | 1,010<br>[116] | 0.415<br>[0.019]  | 0.007                           | -0.001                          | -0.008                          |
| Years of experience                | 512<br>[55]                 | 3.585<br>[0.264]  | 1,123<br>[112]            | 4.176<br>[0.196]  | 1,014<br>[116] | 4.115<br>[0.186]  | -0.591*                         | -0.530                          | 0.061                           |
| Any work<br>experience             | 512<br>[55]                 | 0.697<br>[0.030]  | 1,123<br>[112]            | 0.732<br>[0.018]  | 1,014<br>[116] | 0.715<br>[0.016]  | -0.035                          | -0.018                          | 0.017                           |
| Few female<br>relatives work       | 511<br>[55]                 | 0.466<br>[0.027]  | 1,118<br>[111]            | 0.453<br>[0.019]  | 1,004<br>[116] | 0.455<br>[0.018]  | 0.013                           | 0.011                           | -0.003                          |
| High school or<br>higher education | 512<br>[55]                 | 0.529<br>[0.048]  | 1,122<br>[111]            | 0.524<br>[0.023]  | 1,014<br>[116] | 0.462<br>[0.023]  | 0.005                           | 0.068                           | 0.063*                          |
| Age                                | 512<br>[55]                 | 29.488<br>[0.388] | 1,122<br>[111]            | 29.619<br>[0.305] | 1,014<br>[116] | 30.105<br>[0.328] | 0.130                           | -0.616                          | -0.486                          |

\* = p < 0.10, N = sample size, SE = standard error.

Source: Authors' calculation using data from Job Talash.

**Table 2: Descriptive Statistics and Balance: Male Subscribers**

| Variable                        | N/[Clusters]   | (1)                             | N/[Clusters]   | (2)                  | t-test<br>Difference<br>(1)-(2) |
|---------------------------------|----------------|---------------------------------|----------------|----------------------|---------------------------------|
|                                 |                | Mixed<br>Transport<br>Mean/[SE] |                | Control<br>Mean/[SE] |                                 |
| Proportion applied baseline     | 2,369<br>[120] | 0.048<br>[0.009]                | 3,479<br>[180] | 0.034<br>[0.008]     | 0.014                           |
| Working at baseline             | 2,368<br>[119] | 0.590<br>[0.012]                | 3,475<br>[176] | 0.616<br>[0.011]     | -0.026                          |
| High women's mobility household | 2,360<br>[119] | 0.278<br>[0.013]                | 3,457<br>[176] | 0.263<br>[0.009]     | 0.015                           |
| Years of experience             | 2,368<br>[120] | 9.977<br>[0.212]                | 3,479<br>[180] | 10.496<br>[0.178]    | -0.519*                         |
| Any work experience             | 2,369<br>[120] | 0.916<br>[0.007]                | 3,479<br>[180] | 0.924<br>[0.005]     | -0.008                          |
| Few female relatives work       | 2,353<br>[119] | 0.620<br>[0.015]                | 3,437<br>[176] | 0.621<br>[0.011]     | -0.001                          |
| High school or higher education | 2,368<br>[119] | 0.352<br>[0.016]                | 3,475<br>[176] | 0.322<br>[0.017]     | 0.030                           |
| Age                             | 2,368<br>[119] | 29.241<br>[0.191]               | 3,475<br>[176] | 29.689<br>[0.158]    | -0.448*                         |

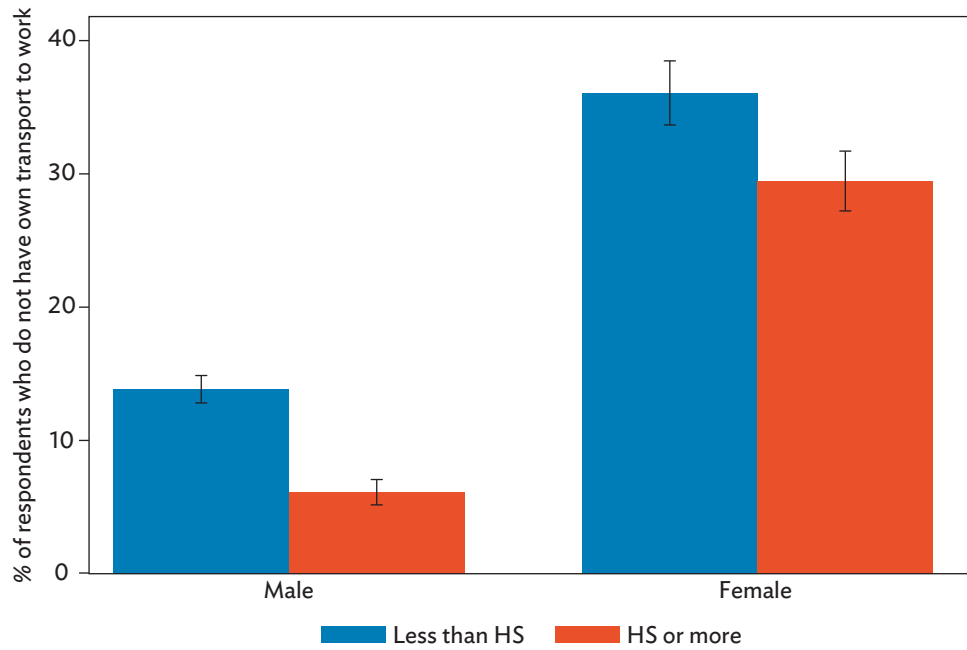
\* =  $p < 0.10$ , N = sample size, SE = standard error.

Source: Authors' calculation using data from Job Talash.

Among women who signed up for Job Talash, most reported that they did not have their own mode of transport to get to work (Figure 6). Women's stated willingness to commute also varied across modes: only about half the female subscribers were willing to take a public wagon (the most crowded mode of travel, with limited separation between women and men); just under 80% were comfortable traveling by rickshaw (Figure 7). More than 90% of subscribers were willing to take a pick-and-drop to work if provided, suggesting the likely safety and acceptability of the transport treatment we offered. Indeed, at baseline, the vast majority of women who expressed some interest in taking a job reported that an offer of a pick-and-drop service would increase their likelihood of taking a job (Figure 8).



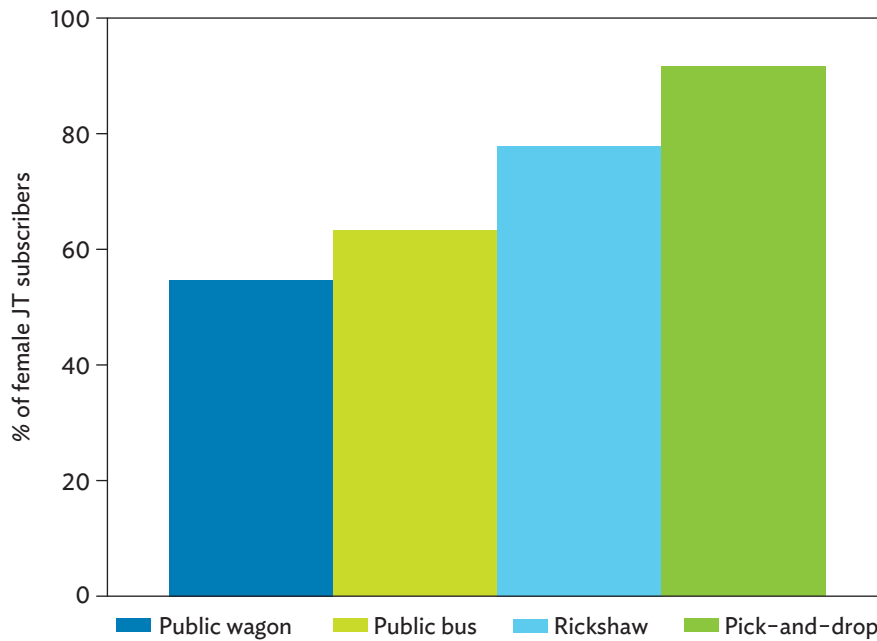
**Figure 6: Gender Differences in Transport Options Among Jobseekers Who Join Job Talash**



HS = high school.

Source: Authors' calculations using data from Centre for Economic Research in Pakistan Women's Mobility Project Job Talash platform.

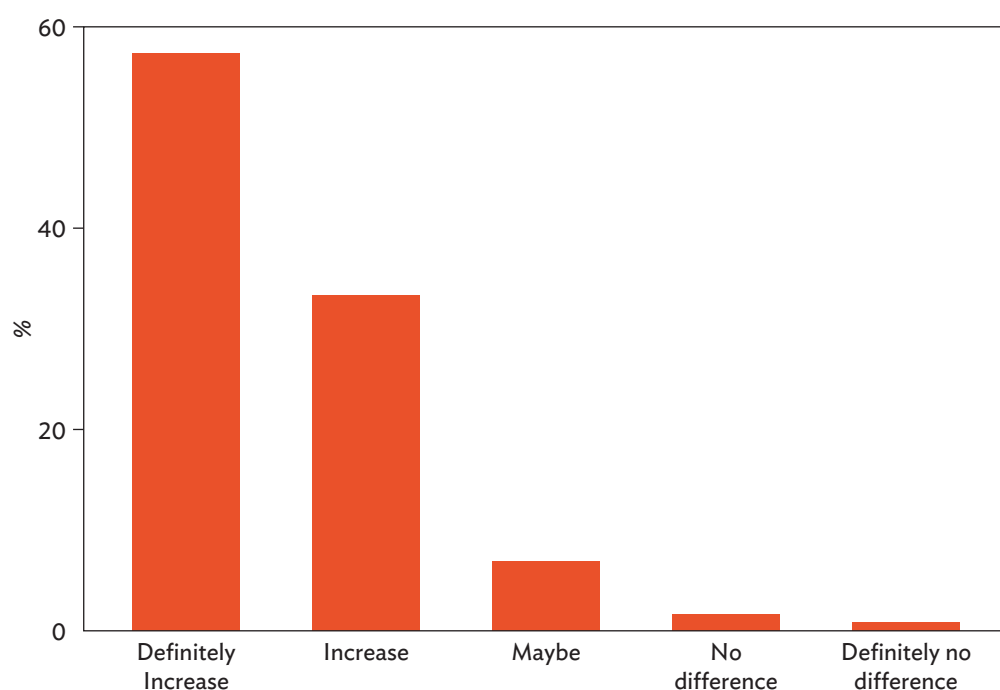
**Figure 7: Women's Willingness to Commute Using Various Transport Modes**



JT = Job Talash.

Source: Authors' calculations using data from Centre for Economic Research in Pakistan Women's Mobility Project Job Talash platform.

**Figure 8: Stated Anticipated Effect of a Transport Offer on Probability of Taking a Job Among Female Latent Jobseekers in Household Survey**



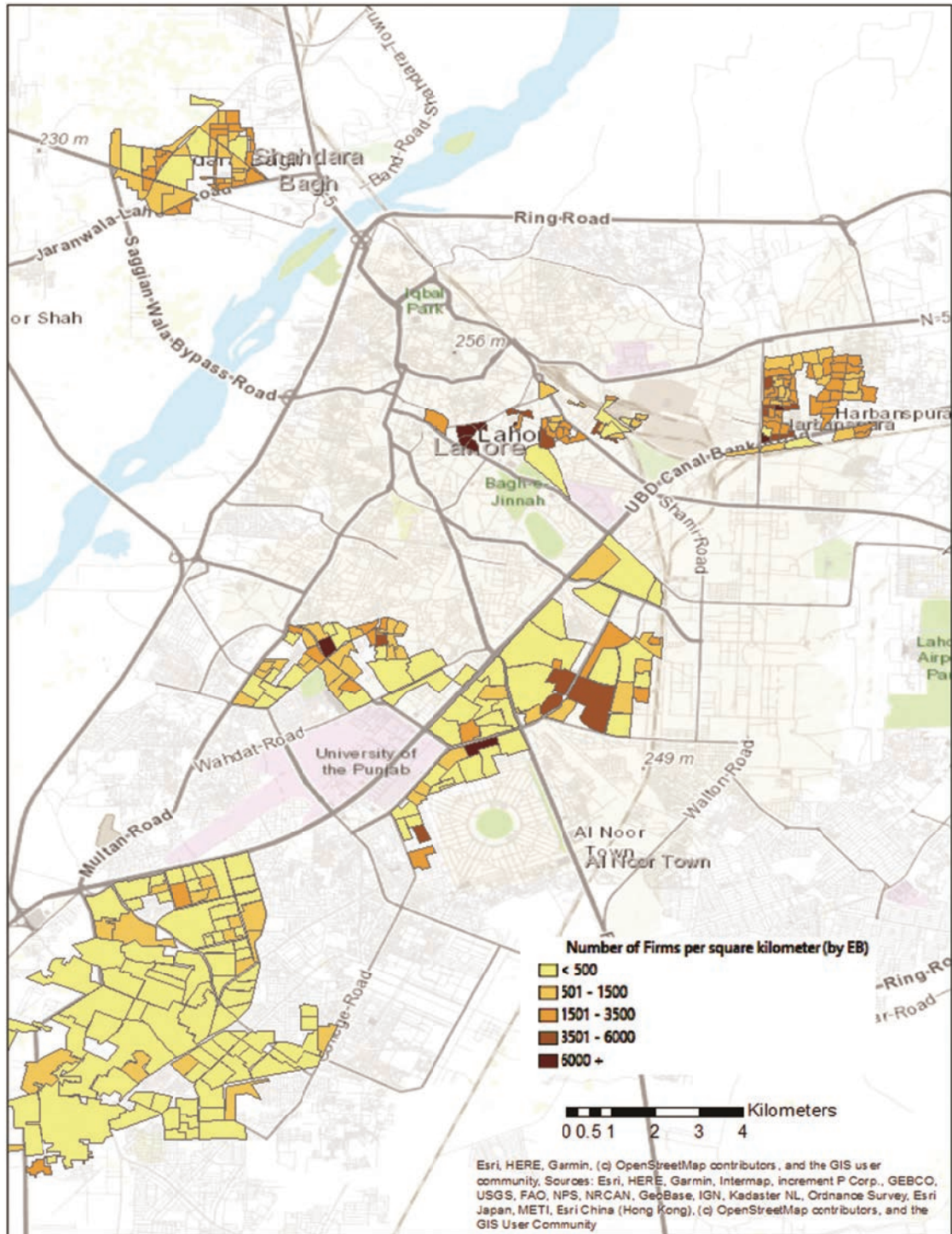
Note: The sample size is the 11,138 female respondent who were not currently working and who initially answered 'definitely willing to work' or 'willing to work' when asked 'would you be willing to work if you find a suitable job?'

Source: Authors' calculations using data from Centre for Economic Research in Pakistan Women's Mobility Project Job Talash platform.

## B. Enrolling Firms

We listed a representative sample of 10,000 firms across the metropolitan area, using a similar approach as described above for individual respondents, i.e., a cluster-randomized selection of enumeration blocks followed by a listing of all firms in each selected block (Figure 9). A team of enumerators presented the Job Talash service to firms, offering them the opportunity to enroll to list vacancies immediately or later. Firms who signed up through this mechanism were referred to as Sample A. Most firms responding had never advertised jobs on any public platform, and usually recruited through networks. In a second sample, Sample B, we also promoted the service publicly and included firms who self-selected to sign up. Approximately 1,200 firms signed up across these two samples, of which approximately half had posted jobs as of July 2021. These firms are re-approached on a regular basis approximately once every 1–2 months, and approximately 10% of firms post jobs with the service on each round of outreach. Any firm can also call Job Talash to post a job at any time.

**Figure 9: Firm Density Across Firm Listing Enumeration Blocks**

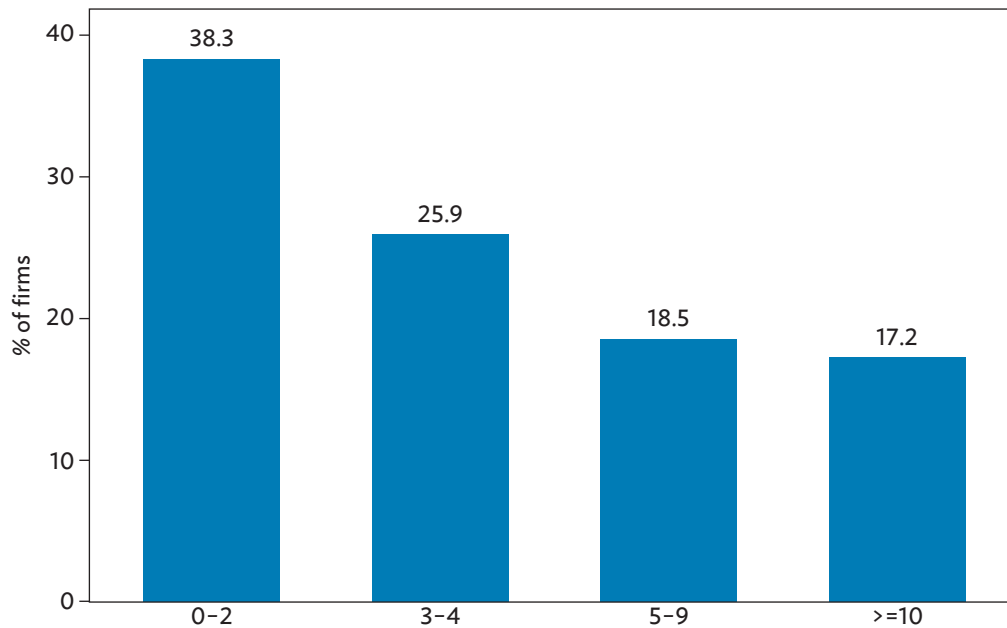


EB= enumeration blocks.

Source: Authors' calculations using data from Centre for Economic Research in Pakistan Women's Mobility Project firm survey.

Firms of all sectors signed up for the Job Talash platform. Most had fewer than five employees (Figure 10). The majority were in service sectors (Figure 11); this reflects the large proportion of firms in the representative sample in the service sector, as signup rates were similar in this sector to other sectors. The vast majority of employers had no female employees; larger firms were more likely to have female employees (Figure 12). However, a substantial fraction of employers with no female employees who posted jobs opened them to female applicants, although this is not required by law or by the platform (Figure 13). Firms posted ads for jobseekers across education and experience levels. Most job ads offered a listed monthly salary of PRs10,000–PRs30,000 (corresponding to approximately \$60–200 per month), as shown in Figure 14; the salary ranges were similar for jobs open to men and women. The average job in the study sample required two years of experience (Table 3).

**Figure 10: Size of Firms Signing Up to Job Talash**

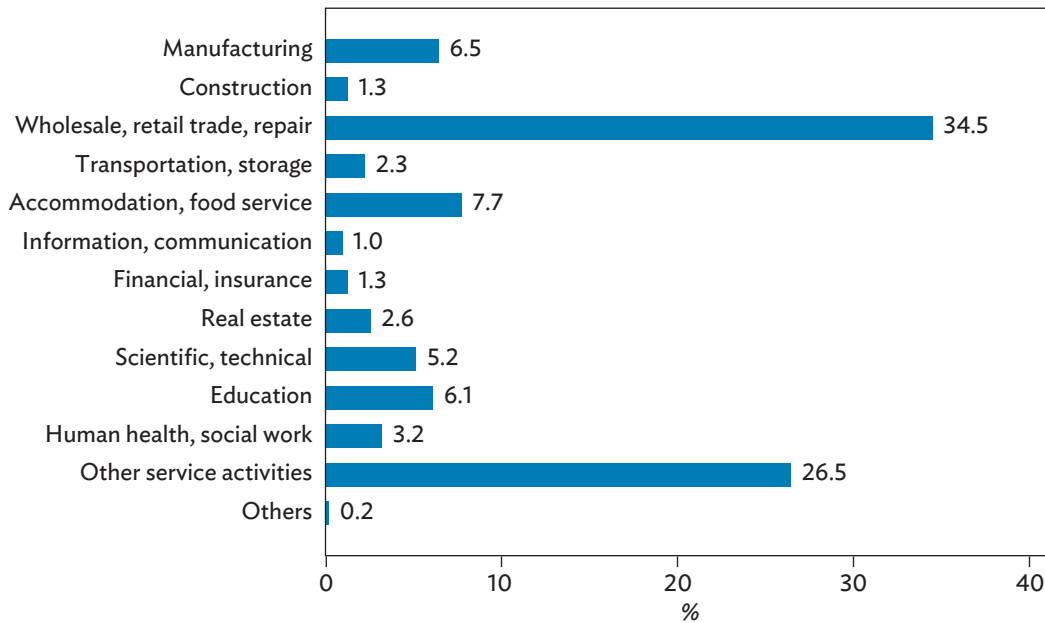


*Survey question: How many employees work at this location? Please include yourself or anyone who receives a salary or wage, even if you hired someone from your family or someone you know.*

Note: The sample size of 841 includes firms that signed up for Job Talash.

Source: Authors' calculations using data from Centre for Economic Research in Pakistan Women's Mobility Project firm survey.

**Figure 11: Industry Classification of Firms Posting Job Ads on Job Talash**

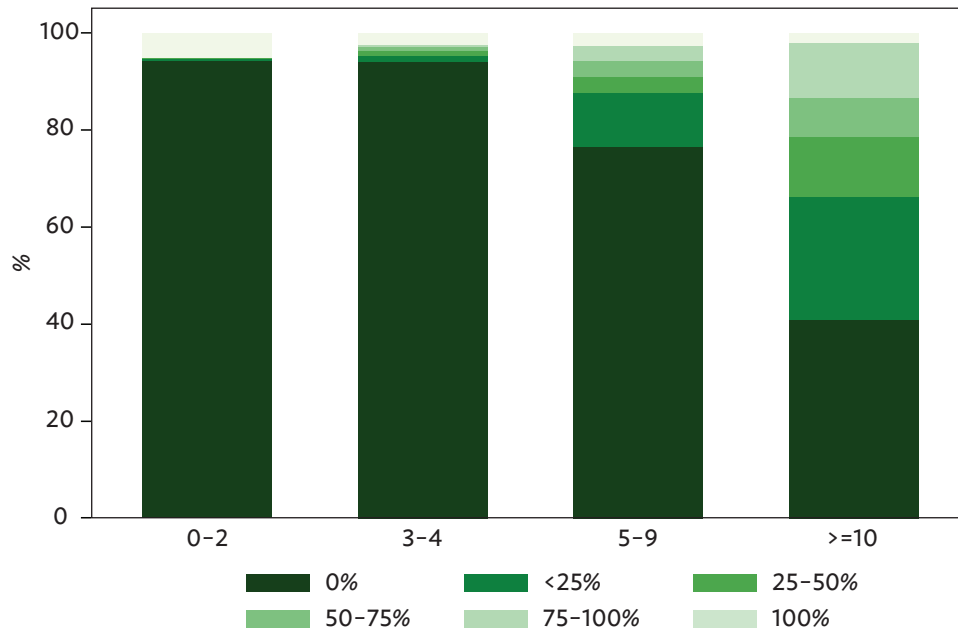


Survey question: Based only on your observation from outside the firm, which industry classification best describes this organization?

Note: The sample size of 319 includes only firms from the representative sample that listed ads on Job Talash.

Source: Authors’ calculations using data from Centre for Economic Research in Pakistan Women’s Mobility Project firm survey.

**Figure 12: Share of Female Employees By Firm Size**

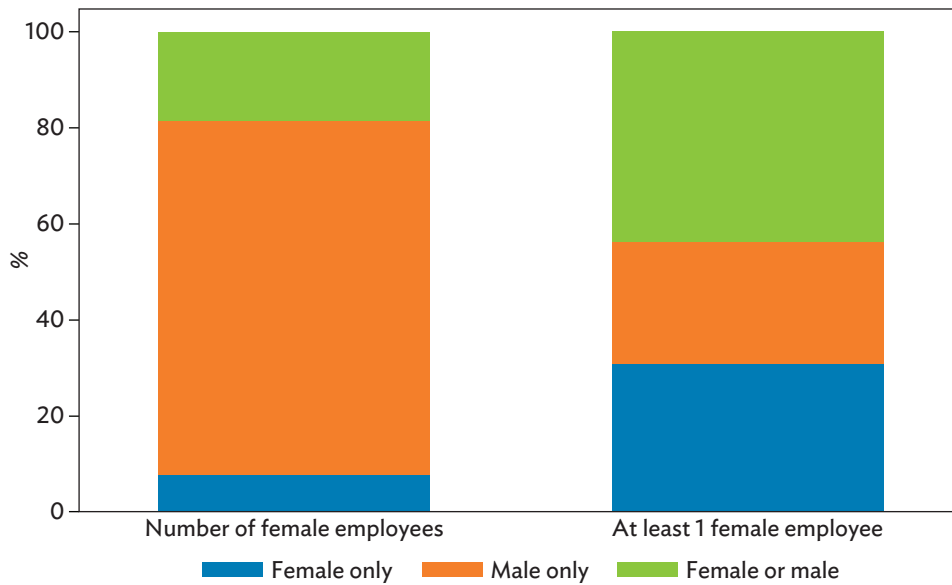


Survey question: Out of the employees who work at this location, how many are female?

Note: The sample size is 840 firms.

Source: Authors’ calculations using data from Centre for Economic Research in Pakistan Women’s Mobility Project firm survey.

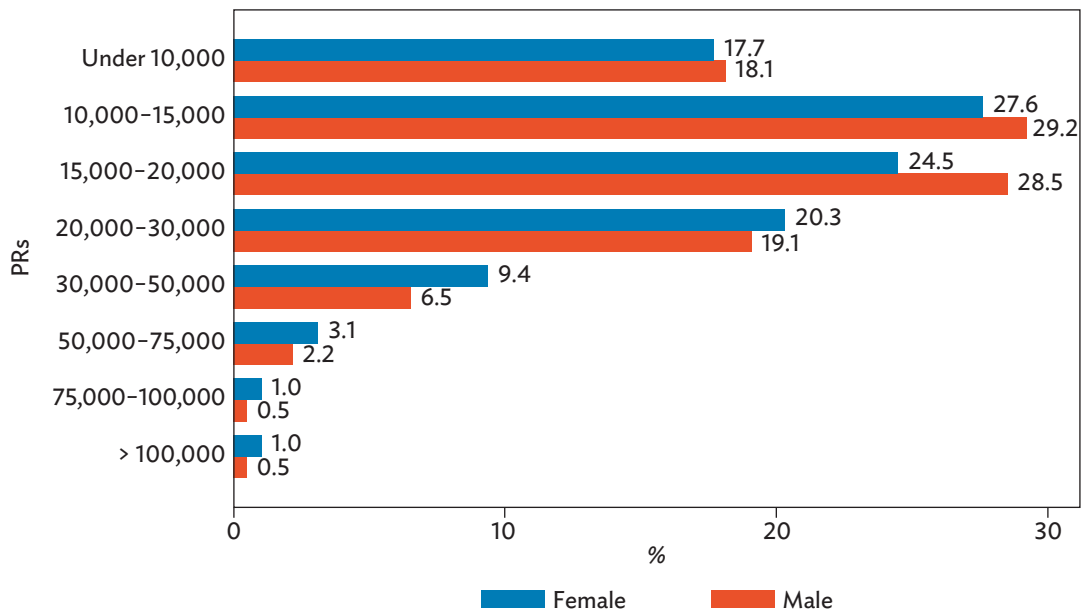
**Figure 13: Comparison of Job Ads Posted on Job Talash Open to Men and Women Between Firms With No Female Employees and Those With at Least One**



Note: Firm survey representative sample: no. of ads = 616; no. of firms = 316.

Source: Authors' calculations using data from Centre for Economic Research in Pakistan Women's Mobility Project firm survey.

**Figure 14: Salaries of Job Ads Posted on Job Talash Open to Men and Women**



Note: Jobs open to both women and men are included in both groups. Minimum salary range for each job is shown. The sample size of 616 includes ads only from the representative sample of firms.

Source: Authors' calculations using data from Centre for Economic Research in Pakistan Women's Mobility Project Job Talash platform.

**Table 3: Descriptive Statistics and Balance: Job Ads**

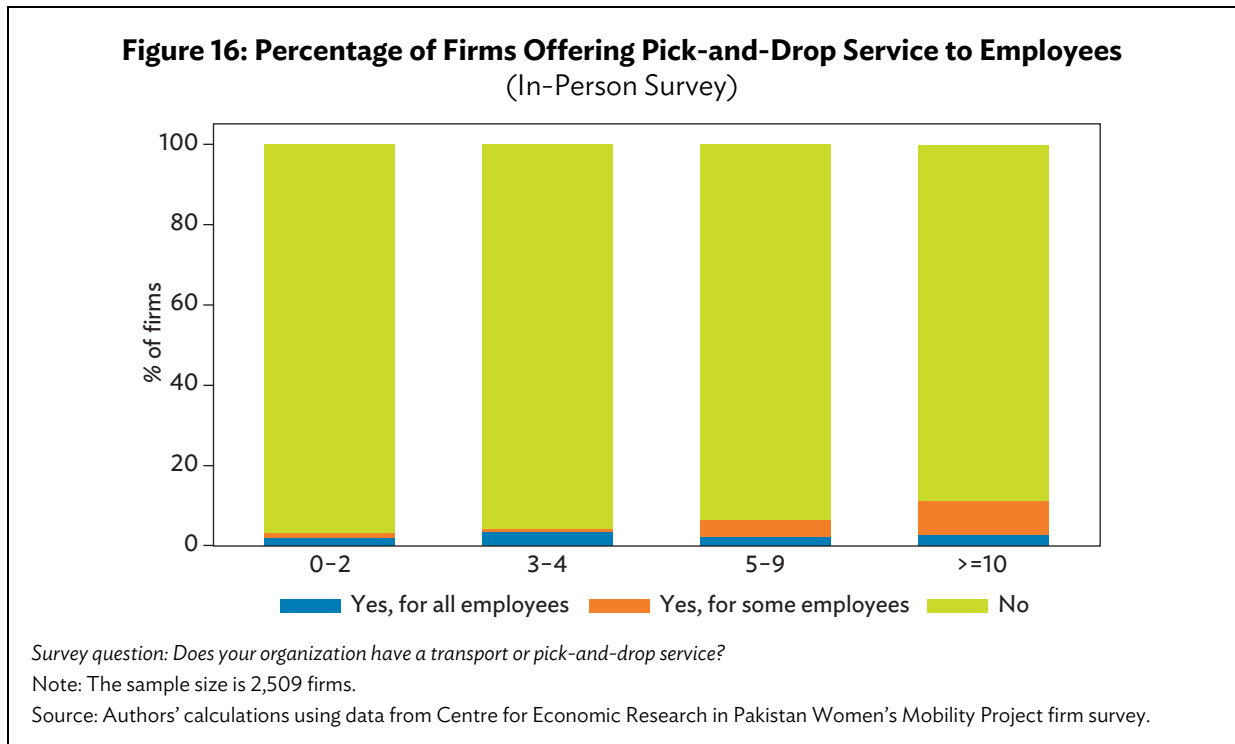
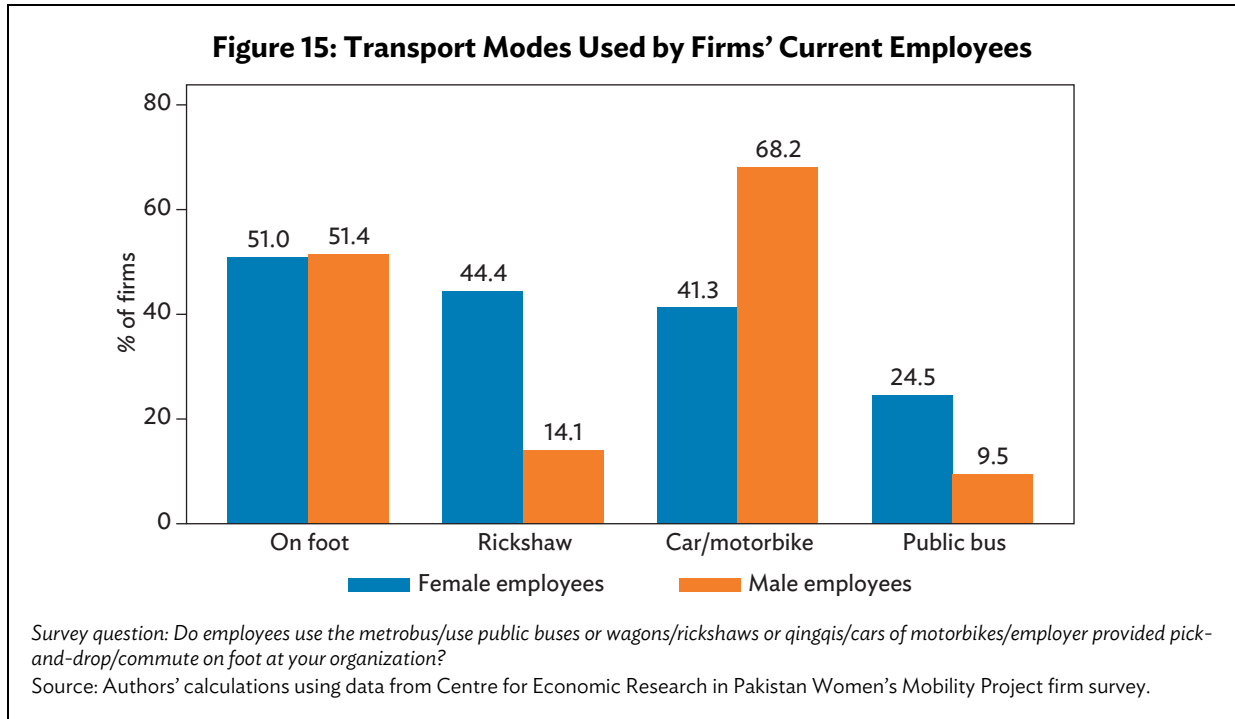
| Variable                                 | (1)          |                  | (2)          |                  | (3)          |                  | t-test             |                    | t-test             |  |
|--|--------------|------------------|--------------|------------------|--------------|------------------|--------------------|--------------------|--------------------|--|
|  | N/[Clusters] | Mean/[SE]        | N/[Clusters] | Mean/[SE]        | N/[Clusters] | Mean/[SE]        | Difference (1)-(2) | Difference (1)-(3) | Difference (2)-(3) |  |
| Ln(Job posting salary)                   | 92<br>[16]   | 7.915<br>[0.693] | 188<br>[34]  | 8.512<br>[0.240] | 96<br>[16]   | 8.367<br>[0.250] | -0.597             | -0.452             | 0.145              |  |
| Job salary not posted                    | 92<br>[16]   | 0.163<br>[0.070] | 188<br>[34]  | 0.101<br>[0.020] | 96<br>[16]   | 0.115<br>[0.027] | 0.062              | 0.048              | -0.014             |  |
| Years experience required -5% winsorized | 88<br>[15]   | 1.932<br>[0.195] | 182<br>[33]  | 2.280<br>[0.158] | 95<br>[15]   | 2.011<br>[0.240] | -0.348             | -0.079             | 0.270              |  |

Ln = natural log, N = sample size, SE = standard error.

Note: Years of experience required have been winsorized at 5%, meaning that the top (bottom) 5% of data points were replaced by the maximum (minimum) values at the threshold to minimize the influence of outliers.

Source: Authors’ calculation using data from Job Talash, 2019.

The status quo modes of commute by firms' employees differed dramatically by gender. Far more employers reported that more of their male employees traveled to work on a car or motorbike than their female employees, while far more of their female employees traveled to work by rickshaw or public bus than male employees (Figure 15). Very few employers provided transport services for employees (Figure 16).





### C. Job Matching

At the enrollment stage, each firm was invited to list any current vacancies. Firms were also contacted periodically to submit new vacancies. For each new vacancy listed on Job Talash, the team identified matching applicants based on required educational level and years of experience. Job Talash informed applicants about vacancies to which they were matched by SMS and/or phone call. The Job Talash team sent a packet of CVs of interested applicants to the firm, who then chose whether or not to call them for interviews. After several days, the Job Talash team called the firm to gather follow-up data on the applicants and interviews. Approximately 8,500 of the subscribers in the sample received a job ad for at least one job over the period we study in this paper.

Because we provided information to both sides, we observed exactly the same information as both sides of the market up to the point of an interview. This allowed us to experiment easily with this information and reduced the scope for analysis to be distorted by unobserved information. Each observation in our study was one ad sent to one respondent who met the basic qualifications for that job. Our key outcome variable of interest to study labor supply responses was an indicator for whether respondent  $i$  applied to job ad  $j$ . The key advantage of this outcome variable, collected on the Job Talash platform, is that it isolates the initial labor *supply* decision, separate from decisions that the *employer* may make to select applicants based on gender, distance, physical mobility/transport options, or the interaction of these factors.

In the control group, approximately 14% of respondents applied to any job; conditional on applying, a respondent applied on average to approximately 8.6% of job ads sent. The overall per-job application rate was thus approximately 1%. This per-job application rate was expected to be this low for two reasons: first, each jobseeker received multiple job ads; second, we deliberately recruited economically inactive individuals who were neither working nor searching for jobs at baseline.

## III. EXPERIMENTAL DESIGN

Using the Job Talash platform, we tested the overall impact of an offer of transport to work on men, women, and the differential impact for women of transport exclusively for women. We experimentally varied access to a subscription service for daily commuting and studied how this affected job search. With each job advertised, all respondents received information on the salary, the distance to the job, and the cost of a rickshaw ride from their home to the office—the status quo commute mode for many women. Treatment group respondents also received an offer of a pick-and-drop service available to reach the specific job in the ad, i.e., a door-to-door subscription 12-seat wagon that would take them to and from the workplace every day (Figure 17). The transport was for commuting daily on the basis of a monthly subscription, not transport to apply or interview for the job. This kind of “pick-and-drop” service is a familiar concept in this context, as a select number of large firms offer it as a benefit or a paid subscription to their employees. The limited use of this option by firms could reflect a combination of factors including coordination costs across small firms, and the difficulty of upfront investment in a transport service when firms are uncertain about how many female employees might join and when. Effectively, our treatment overcame those coordination costs to make the service available to a randomized sample of jobseekers for all jobs in treated areas.

**Figure 17: Pick-and-Drop Van Offered to Jobseekers**

Source: Authors.

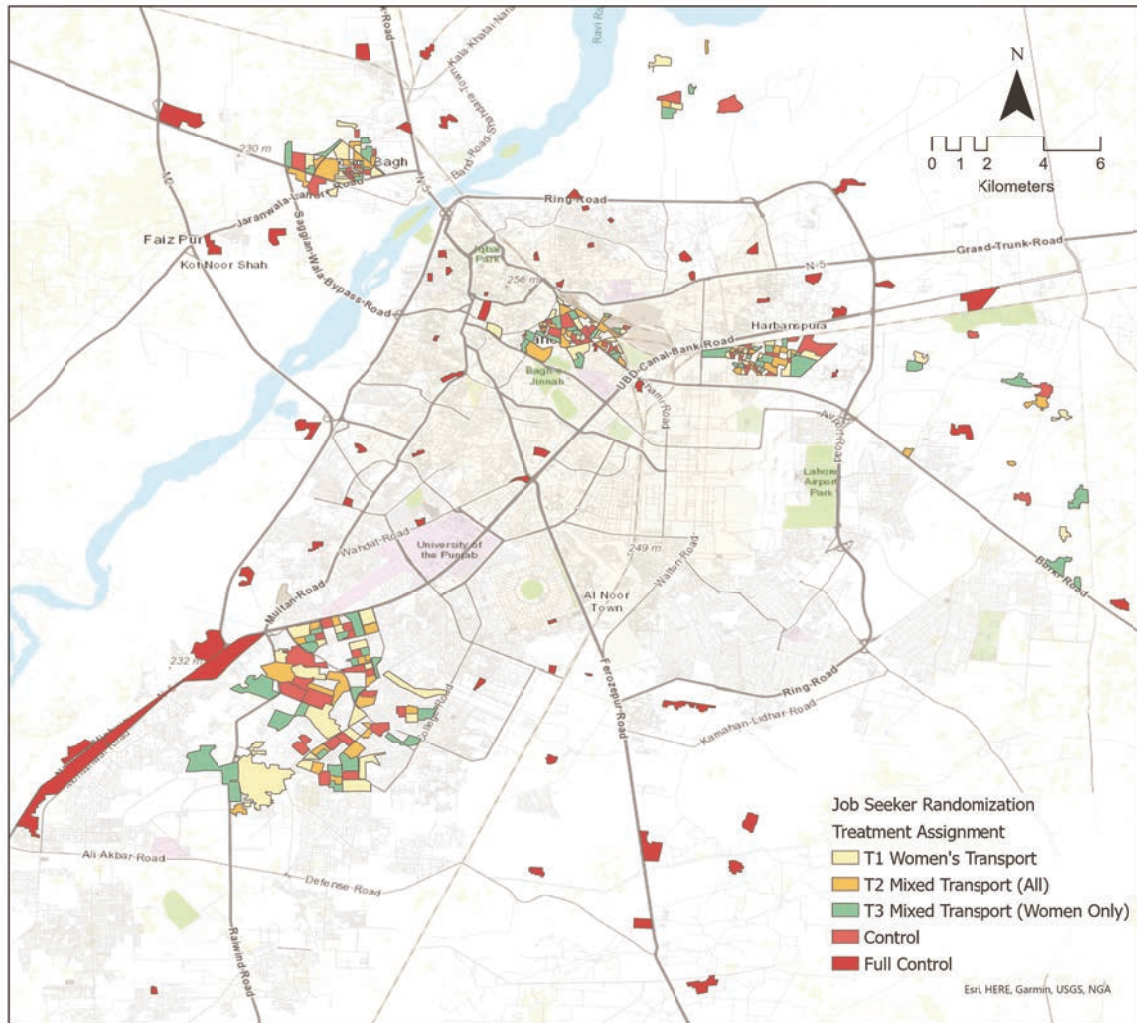
Respondents were randomized by residential neighborhood (enumeration block) into the following treatment arms (Figure 18):

- T1: The main treatment tested the effect of a female-only service, which provides an environment as close as possible to eliminating threats to safety, harassment, and stigma.
- T2: The first comparison group received a mixed-gender transport service, which provides identical cost savings and convenience but without eliminating the threat of harassment and stigma. This also allowed us to compare the effect of the transport offer on male and female respondents. (Based on typical standards in this setting, male and female seating would likely be expected to be by default separate to the degree possible within the vehicle, but this is not guaranteed.)
- C: In a control group, no transport was offered.

Once respondents were randomized into treatment arms, the Job Talash call center reached out to them with a call dedicated to explaining the transport service. If the center did not reach a respondent in this initial round of calls, they gave them this briefing on the next job application call in which they had contact with the respondent. Information about which jobs had transport offered was only issued after this initial briefing to avoid confusion. Once the respondent received the briefing, future job ad SMS messages and calls included information about the transport option available with each ad.

The respondent could decide whether to subscribe to the transport if she took up the job advertised; the script emphasized that it was optional.

**Figure 18: Treatment Assignment of Jobseekers by Residential Neighborhood**



Source: Authors’ calculations using data from Centre for Economic Research in Pakistan Women’s Mobility Project Job Talash platform.

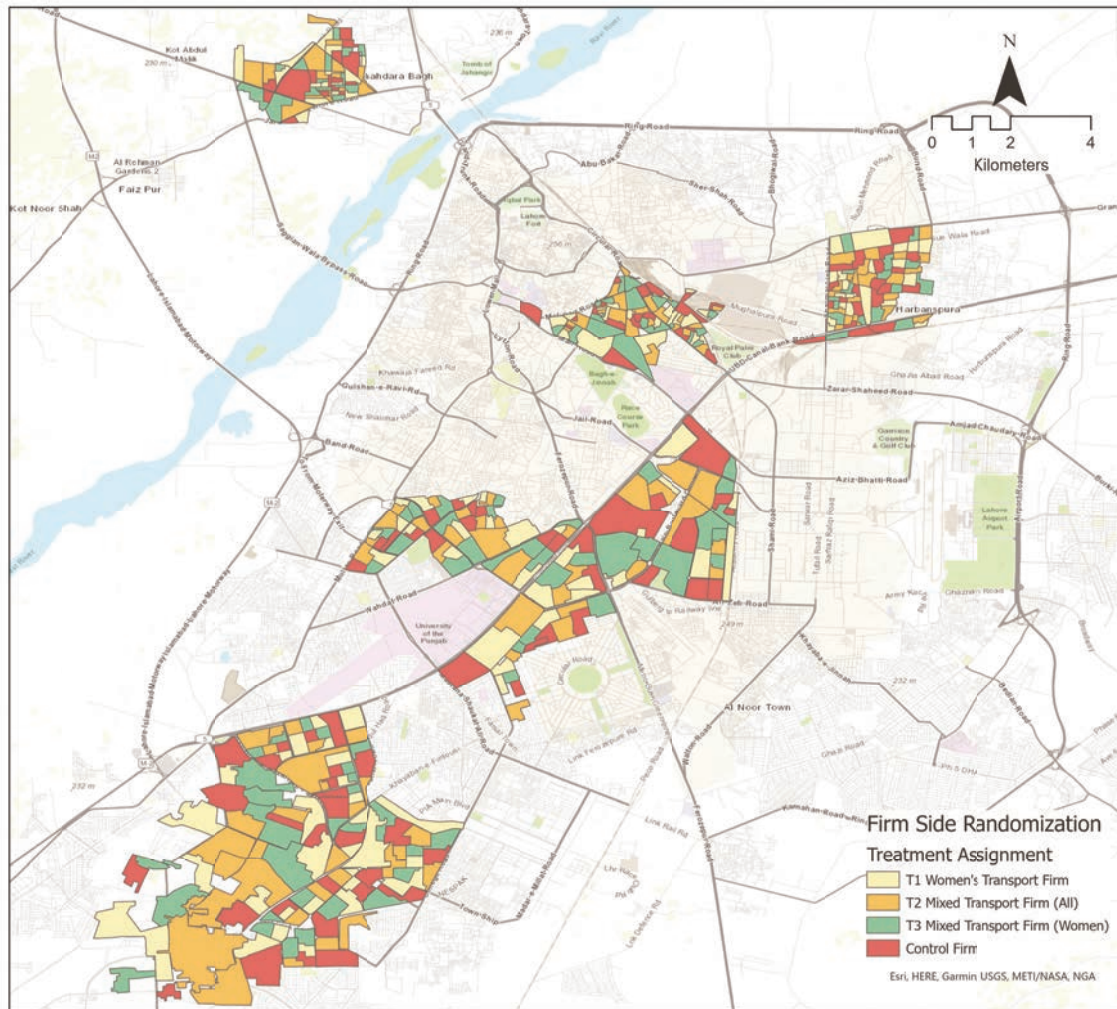
Treatment group respondents were further randomized into receiving transport offers at the base price, a 50% discount, and a 75% discount. The base price was set to approximate the market price, i.e., the break-even price for the service at full take-up. The price varied for each job sent based on distance between the respondent’s home and the job location. The base price was approximately 20% less than the cost of a rickshaw, the status quo commute mode for many middle-class female commuters. Respondents were informed that the transport service would be offered for at least one year at the set price.

To avoid signaling other information about the job, all communications emphasized that the transport was offered by Job Talash, not the employer; and the scripts explicitly clarified that the employer may have male, female or a mixture of employees. In addition, both treatment and control groups received information in the SMS and phone call about the distance to the job and the cost of a rickshaw.

Firms were also randomized by enumeration block into treatment or control arms (Figure 19). Only job matches for which both the jobseeker and job ad were in the treatment group were assigned to treatment.

The Pre-Analysis Plan registered on the American Economic Association’s registry for randomized controlled trials (Field and Vyborny 2019) includes a more comprehensive description of the design.

**Figure 19: Treatment Assignment of Firms by Neighborhood**



Source: Authors’ calculations using data from Centre for Economic Research in Pakistan Women’s Mobility Project firm survey.

## IV. ESTIMATION

The Job Talash service actively provides job match services and transport offers. In this paper, we used administrative data from 24 September 2018 to 22 October 2019. After that date, experimental protocols were updated, and new treatment conditions incorporated; the analysis for later phases of the experiment is ongoing.

Job ads for firms from Sample B (self-enrolled firms), who were omitted from the transport randomization in this phase, are excluded from the sample. Results are similar when we include them in the sample and include a fixed effect for such firms.

In some cases, transport was assigned to a job match, but the respondent was not informed. This could have happened for two reasons. First, if we had not yet reached the respondent with a verbal briefing on the transport treatment, we did not begin offering transport with job ads. Second, in some cases the distance between the respondent and the firm was missing in our data at the time job ads were being sent out, e.g., due to miscoded job locations. In such cases, neither distance nor a transport offer could be communicated to the jobseeker. (We include a dummy for missing distance information in all specifications.) For this reason, we use the randomized treatment assignment as an instrument for the actual offer of transport communicated to the respondent.

To examine jobseeker application responses, we first examine the overall effect of the transport offer on women and men, pooling the treatment arms for women together. We estimate the following Two-Stage Least Squares model:

$$OFFERTRANSPORT_{ij} = \pi_0 + \pi_1 ASSIGNTRANSPORT_{ij} + \pi_2 FEMALE_i + \pi_3 OFFERTRANSPORT_{ij} \times FEMALE_i + \eta X_i + \delta Z_j + \phi Q_{ij} + v_{ij} \quad (1)$$

$$APPLY_{ij} = \beta_0 + \beta_1 OFFERTRANSPORT_{ij} + \beta_2 FEMALE_i + \beta_3 OFFERTRANSPORT_{ij} \times FEMALE_i + \phi X_i + \psi Z_j + \xi Q_{ij} + \epsilon_{ij} \quad (2)$$

Where the unit of observation is the respondent  $i$  – job ad  $j$  pair for each ad sent to a respondent.  $APPLY_{ij} = 1$  if jobseeker  $i$  applies to job ad  $j$ .  $ASSIGNTRANSPORT_{ij} = 1$  if transport was randomly assigned to job ad  $j$  for respondent  $i$ ; and  $OFFERTRANSPORT_{ij} = 1$  if transport was offered to that job ad for that jobseeker.  $X$  is a vector of person-level control variables including baseline application rate, years of experience, baseline job search, education, the prevalence of labor force participation among female relatives of the household, whether women in the household travel independently, and the respondent's stated need for transport services.  $Z$  is a vector of job ad-level control variables including salary, and  $Q$  is a vector of match-specific control variables including distance between the jobseeker's baseline residence and the firm location. Standard errors are two-way clustered according to the two-sided randomization (jobseeker residential neighborhood, i.e., enumeration block and firm neighborhood).<sup>1</sup>

<sup>1</sup> This approach implicitly treats each job application decision as independent. There could be spillovers if treatment leads jobseekers to substitute between treatment and control jobs, or alternatively increases jobseeker engagement with the service overall such that they apply at higher rates to control jobs. We test for this empirically and find some evidence of a small degree of substitution between jobs for women in the mixed transport arm; ongoing work will explore this in more detail.

## V. RESULTS

Tables 1–3 show descriptive statistics and balance in our original randomized assignment for female and male jobseekers and job ads.

Table 4 shows the first stage. Overall, 36% of job ads sent to women that were assigned to receive a women’s transport offer included that offer. The first stage coefficient is larger for men than for women. This is in part because of higher success rates in reaching women on the phone to deliver the transport briefing, as well as higher rates of ads for female applicants among self-enrolled firms (Sample B), who were excluded from transport offers in this phase.

**Table 4: First stage: Effect of Random Assignment of Transport Treatment on Transport Offer Delivered to Subscriber  $i$  with Job Ad  $j$**

|                                | (1)                           | (2)                     | (3)                     |
|--------------------------------|-------------------------------|-------------------------|-------------------------|
|                                | Offered Female Only Transport | Offered Mixed Transport | Offered Mixed Transport |
| Assigned female only transport | 0.3639***<br>(0.0842)         | -0.0046*<br>(0.0028)    |                         |
| Assigned mixed transport       | 0.0013<br>(0.0017)            | 0.4951***<br>(0.0647)   | 0.6250***<br>(0.0768)   |
| Observations                   | 54,444                        | 54,444                  | 308,794                 |
| N jobseeker clusters (EBs)     | 283                           | 283                     | 300                     |
| N firm clusters (EBs)          | 49                            | 49                      | 62                      |
| N jobseekers                   | 2,649                         | 2,649                   | 5,848                   |
| N job ads                      | 173                           | 173                     | 320                     |
| Sample                         | Women                         | Women                   | Men                     |

EB = enumeration block, N = sample size.

Note: Standard errors in parentheses. \* =  $p < .1$ , \*\*\* =  $p < .01$ .

Source: Authors’ calculation using data from Job Talash, 2019.

Table 5 shows the second stage for the full sample: treatment effects of the transport offer on women’s and men’s decisions to apply for jobs. The control group mean is 0.9%, i.e., on average jobseekers on the platform applied to about 1% of job ads. This number is in the range expected given the deliberate enrollment of individuals who may have been willing to search but were not actively searching at baseline and given that the average subscriber received 43 job ads over the period studied. Overall, offering transport approximately *doubled* this application rate. The result is robust across specifications that include a full set of controls (column 2), job ad fixed effects (column 3), or jobseeker fixed effects (column 4).

**Table 5: Effect of Transport Offer on Job Applications: Women and Men**

|  | Applied to Job Ad      |                        |                       |                        |
|--|------------------------|------------------------|-----------------------|------------------------|
|  | (1)                    | (2)                    | (3)                   | (4)                    |
| $\beta_1$ : Offered transport                                    | -0.0052***<br>(0.0018) | -0.0041***<br>(0.0012) | -0.0032**<br>(0.0016) | -0.0038***<br>(0.0013) |
| $\beta_2$ : Offered transport $\times$ female                    | 0.0131***<br>(0.0043)  | 0.0117***<br>(0.0034)  | 0.0104***<br>(0.0037) | 0.0112**<br>(0.0046)   |
| $\beta_3$ : Female   | 0.0038**<br>(0.0016)   | 0.0008<br>(0.0018)     | -0.0012<br>(0.0015)   |                        |
| Observations   | 363,238                | 363,238                | 363,238               | 363,084                |
| N jobseeker clusters (EBs)                                       | 305                    | 305                    | 305                   | 305                    |
| N firm clusters (EBs)  | 66                     | 66                     | 66                    | 66                     |
| N jobseekers   | 8,497                  | 8,497                  | 8,497                 | 8,497                  |
| N job ads  | 376                    | 376                    | 376                   | 376                    |
| Controls   | No                     | Yes                    | No                    | No                     |
| Jobseeker FE   | No                     | No                     | No                    | Yes                    |
| Job ad FE  | No                     | No                     | Yes                   | No                     |
| Control group mean Y   | 0.008                  | 0.008                  | 0.008                 | 0.008                  |
| $\beta_1 + \beta_2$ : Total effect of transport offer on females | 0.0079**<br>(0.0038)   | 0.0076**<br>(0.0032)   | 0.0072**<br>(0.0035)  | 0.0074*<br>(0.0044)    |

EB = enumeration block, FE = fixed effect, N = sample size.

Note: Standard errors in parentheses. \* =  $p < .10$ , \*\* =  $p < .05$ , \*\*\* =  $p < .01$ .

Source: Authors' calculation using data from Job Talash, 2019.

In contrast, male respondents were not encouraged to apply by the offer of transport. In fact, in some specifications, a small negative effect is estimated for men: offering men transport with a job ad decreased their probability of applying to that ad by 0.6 percentage points. Most male jobseekers have their own transport (Figure 5), and many men indicated they prefer to use their own transport. The transport service was always presented to participants as optional. However, men might not have wanted a compensation package that included this; although the salary was announced with each job ad, men might have assumed they would have less room to negotiate the salary or receive fewer other benefits because the compensation package included transport.

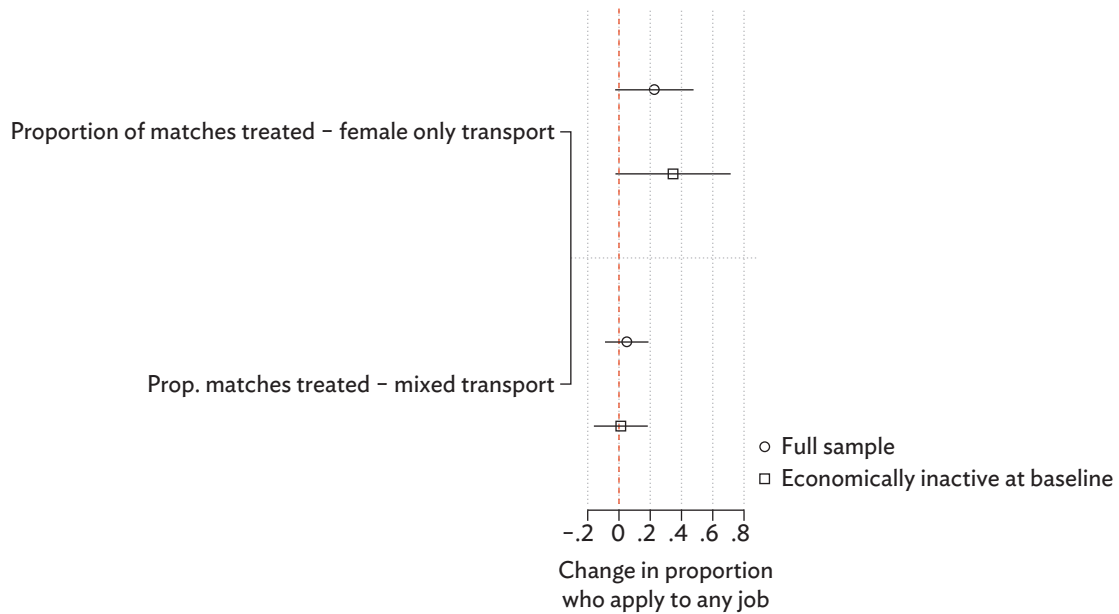
Figure 21 examines the effect of the individual treatment arms on women. Here we restrict the sample to female subscribers only, and estimate:

$$OFFERTRANSPORT_{ijp} = \pi_0 + \sum_{p=1}^3 \pi_p ASSIGNTRANSPORT_{ijp} + \eta X_i + \delta Z_j + \theta Q_{ij} + v_{ij} \quad (3)$$

$$APPLY_{ij} = \beta_0 + \sum_{p=1}^3 \beta_p OFFERTRANSPORT_{ijp} + \phi X_i + \psi Z_j + \xi Q_{ij} + \epsilon_{ij} \quad (4)$$

Where  $p$  indexes the three price levels randomized across jobseekers: the base price, medium discount, and large discount.

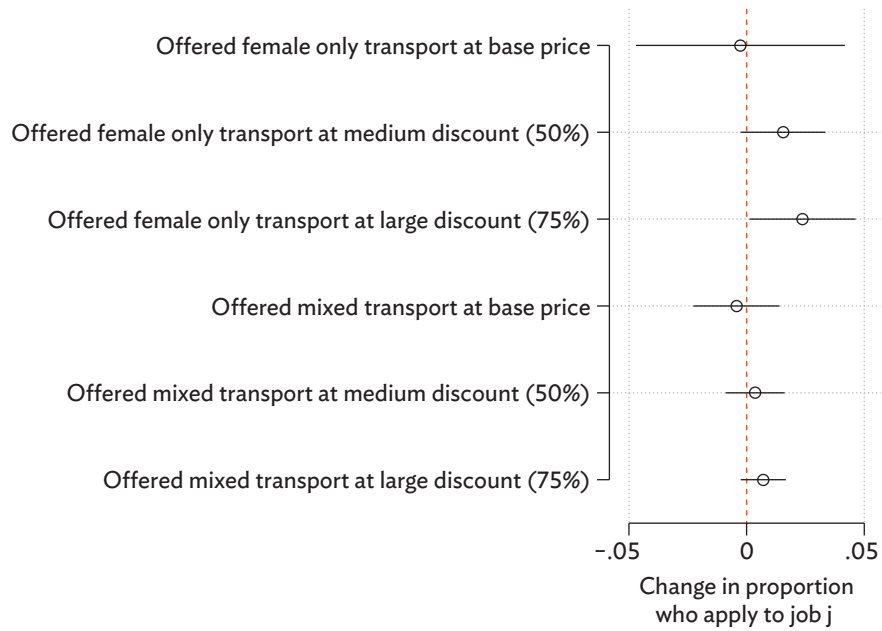
**Figure 20: Effect of Transport Offer on Women’s Job Application Rates – Extensive Margin**



Note: Standard errors two-way clustered by jobseeker cluster and firm cluster. Confidence intervals shown are 90%.

Source: Authors’ calculations using data from Centre for Economic Research in Pakistan Women’s Mobility Project Job Talash job search platform.

**Figure 21: Effect of Transport Offer on Women’s Job Application Rates, by Discount Level**



Note: Standard errors two-way clustered by jobseeker and firm cluster. Confidence intervals shown are 90%.

Source: Authors’ calculations using data from Centre for Economic Research in Pakistan Women’s Mobility Project Job Talash job search platform.



There is a clear gradient in the point estimates over the discount level. At the base price, the estimated effect is almost exactly zero. Participants who received a transport offer with a 50% discount applied at *three times* the rate of the control group. Those who received an offer with a 75% discount applied at *four times* the rate of the control group. Although we cannot reject that the coefficients are equal with the data collected in this phase, the pattern of results demonstrates that women's significant overall response to the women-only transport offer shown in Table 5 is driven by the subsidized arms.

The estimated coefficient for female-only transport is more than twice the estimate for the mixed transport offer, although we cannot reject that the two effects are equal. The pattern of results is suggestive that not only cost and convenience, but also safety and stigma play an important role in mobility constraints on female labor supply.

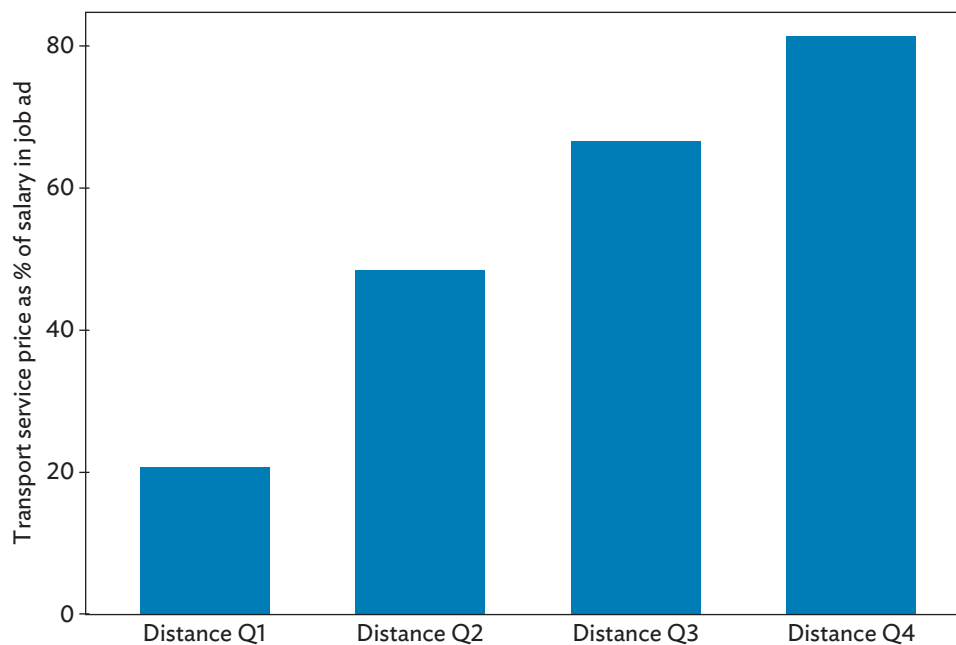
Finally, we examine whether the transport offer led economically inactive "latent jobseekers" who were not working or searching at baseline, but signed up for Job Talash, to apply for jobs. Figure 20 shows the results. The estimates are imprecise; however, the point estimate suggests a large potential effect on the extensive margin for female-only transport offer, and a zero effect for the mixed-gender transport offer. The point estimate for the full sample is 0.2, suggesting that if half the job ads the respondent received were accompanied by a transport offer, her probability of applying for any job on the platform increased by 10 percentage points. The point estimate is slightly larger for respondents who reported that they were neither working nor searching at baseline. While these results are preliminary, the pattern suggests that reducing safety and acceptability constraints on women's mobility could ultimately bring more women into the labor force.

## VI. DISCUSSION

These results show a large and gendered effect of constraints to physical mobility on women's labor supply. The pattern of results, driven by responses to the female-only transport offer, is consistent with safety and social norms being key constraints. Given the apparent importance of these constraints, why do private markets not already provide a service such as the one provided in our experiment?

As shown in Figure 21, the job application response in our experiment was driven by the discounted treatments. These were priced at below the break-even point for the service, i.e., the price that would cover the cost of vehicle rental, driver salary, and fuel when 10 of the 12 seats on the vehicle are booked.

Figure 22 shows the base price of the transport service, which is approximately 80% of the cost of a rickshaw fare, as a proportion of the posted salary. The X axis breaks down the number of job matches respondents received by quintiles of distance from their homes. All the jobs advertised were within the city of Lahore. However, the cost for the service to break even amounts to more than half the posted salary for more than three-quarters of the job ads respondents received.

**Figure 22: Base Price of Transport Service as a Proportion of Posted Salary in Job Ad**

Q = quartile.

Source: Authors' calculations using data from Centre for Economic Research in Pakistan Women's Mobility Project Job Talash platform.

Clearly, paying the full cost of such a transport service would make most potential job matches infeasible for candidates, severely limiting the scope of their job market. Similarly, it would be prohibitively expensive for employers with no female employees who might consider hiring a female candidate; this represents a large percentage of employers in Lahore (Figure 12). In practice, it is only provided by a tiny minority of employers (Figure 16). Grouping employers together so that pick-and-drop routes can be more direct and efficient makes it more cost effective; however, coordination costs are high (e.g., finding people who live and work along a similar route, and work the same hours), which may explain why this practice is uncommon. Ride-hailing services such as Uber and Careem, which are recent entrants to the market, automate this process; but they leave female riders alone with a typically male driver, and thus are often perceived not to address the constraint of safe, acceptable mobility that the group pick-and-drop van provides.

However, there is scope for group transport to become more cost effective over time. Given that women candidates are responsive to transport, if the mobility constraints were relaxed in the short term, firms might start to hire more women. Over a longer period, firms may move to a new equilibrium with more female workers, leading to economies of scale in transport.

On the worker side, young women who are on the margin of entering the labor force after completing education might find the cost of mobility an important constraint in the early part of their careers. If they get past this hurdle, as they build skills and human capital, transport costs would ultimately become a smaller fraction of their wages.

These factors, in addition to existing literature demonstrating the importance of women's economic empowerment for their wellbeing and for the wellbeing of members of their families, suggest that policies that support or subsidize women's mobility may be called for.

The intervention that has the most pronounced effects of what we studied is a reserved space only for women. Thus, our results are relevant to the ongoing policy debate on reserved spaces for women. Our results are consistent with Kondylis et al. (2020), who show that women value these spaces. We further show that offering such an option might help women who wish to do so leave their homes and reach the workplace. However, with our results to date we cannot speak directly to the real concern that they may reinforce attitudes that blame the victim for harassment (Kondylis et al. 2020).

More importantly, our experimental results demonstrate the importance of women's mobility for labor supply. We wish to stress that they do *not* imply that reserved spaces are the only way to achieve this. We anticipate that these results speak to the economic and labor market importance of a broader set of policies designed to help ensure women's mobility, including interventions such as high-quality public transportation, streetlights, and gender-sensitive policing, as well as interventions designed to shift norms directly.

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## Women's Mobility and Labor Supply

*Experimental Evidence from Pakistan*

In this study, we experimentally vary access to a transport service in Lahore, Pakistan, to quantify the overall impact of transport to work on men and women, and the differential impact of transport exclusively for women. The findings show that reducing physical mobility constraints has a large impact on job searching for women, including those who are not searching at baseline. Women's response is driven by a women-only transport treatment arm, suggesting that safety and social acceptability, rather than simply cost, are key constraints.

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